

REMARKS

This paper is in response to the Official Action mailed April 21, 2006.

No amendments are made in the present paper. Claims 20-46 are now presented for the Examiner's consideration in view of the following remarks.

The Application

The present invention provides an accurate technique and apparatus for finding an insulation fault in an underground conveyance sheath that is causing a locating tone to leak to ground. The invention operates by measuring a voltage differential between a reference voltage and a voltage of a probe body in electrical contact, via the conveyance sheath fault, with the locating tone conductor in the underground conveyance. In a region where the conveyance sheath is intact, the locating tone voltage does not affect the voltage differential. Where there is a fault in the sheath causing current leakage from an internal conductor, through a moist medium to the probe, that voltage differential changes. In that way, the fault is detected.

The Examiner has rejected claims 20-25 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent Publication No. 2002/0171433 to Wantanabe et al. ("Wantanabe") in view of U.S. Patent No. 5,530,364 to Mashikian et al. ("Mashikian"), and has rejected claims 26-32, 38, 40 and 42-46 under over Wantanabe in view of Mashikian and further in view of the Applicants' admitted prior art.

Applicants note that no basis for rejection was presented in the Official Action for claims 33-37, 39 and 41.

Applicants respectfully traverse the above rejections and submit the claims are novel and non-obvious for the reasons stated below, and assert that all the claims of the present application are in condition for allowance.

The Wantanabe Publication

The Wantanabe disclosure teaches a method and apparatus for measuring voltage being transmitted in a sheathed high-voltage power cable. The Wantanabe disclosure is NOT directed to measuring voltage resulting from current leaking from a fault in the sheath.

Voltage in the cable is measured indirectly, with the sheath intact. Conductive members 25, 26 are not placed in electrical continuity with the cable conductor, but are brought into close proximity with the cable sheath to form a coupling capacitance C_c (Wantanabe, [0056]). When a high-voltage commercial frequency AC voltage V_1 is applied to the sheathed power cable, a current i_{cs} that is proportional to the voltage V_1 in the power cable flows to a voltage measuring apparatus where it is measured (Wantanabe [0059]-[0060]). Wantanabe does not measure a voltage between the cable conductor and ground.

Wantanabe does not teach any fault in the high-voltage cable sheath, and does not teach any current being conducted from the high voltage cable conductor.

The Mashikian Patent

The Mashikian patent teaches a method and apparatus for locating a fault in a buried power cable. The disclosed technique utilizes a pair of sensors that measure a magnetic field outside the power cable:

The two sensors 30 and 32 are typically spaced six to twelve inches apart, and have the ability to convert the residual magnetic field outside the power line 10 to current or voltage pulses using the principle of electromagnetic induction. When the PD site 24 is between the sensors 30 and 32, the PD pulses travel in opposite directions away from the site 24. In this position, the sensors 30 and 32 are designed to induce voltage signals 44 and 46 of opposite polarity, respectively, as illustrated in FIG. 5a.

(Mashikian, col. 6, lines 1-9). The sensors of Mashikian are not placed in electrical continuity with the cable, but are instead insulated from the cable by an insulating layer 52 (col. 6, lines 56-60; FIG. 6). Mashikian does not measure a voltage between the cable and ground, but instead measures current or voltage induced in the sensors by a magnetic field around the cable.

Obviousness Rejections

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. M.P.E.P. § 2143.03 (citing *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). Applicants assert that the claims as presented are patentable over the cited reference because limitations contained in the claims are not taught or suggested in the art of record.

The examiner has rejected independent **claim 20** as obvious over Wantanabe in view of Mashikian. Applicants respectfully traverse that rejection because neither Wantanabe nor Mashikian teaches or suggests the following limitation:

at least one voltage probe adapted to be positioned adjacent the cable and displaced along the cable whereby the liquid conducts at least a portion of the current between the probe and an insulation fault on the cable.

The Examiner cites Wantanabe as disclosing that limitation. Wantanabe does not teach current conducted between the conductive members 25, 26 and an insulation fault. In fact, no insulation fault is taught by Wantanabe. Instead, the conductive members 25, 26 form a capacitance with the sheathed power cable (Wantanabe [0056]).

For at least the above reasons, Applicants submit that independent claim 20, as well as **claims 21-25** which depend from claim 20 and incorporate its limitations, are patentable over Mashikian.

Independent **claim 26** requires that the “at least one voltage probe [be] adapted to be positioned adjacent the cable to establish electrical continuity with the cable. No such continuity may be established with the conductive members 25, 26 of Wantanabe because the power cable sheath is intact. No such continuity may be established with the probe of Mashikian because that probe is insulated. For at least that reason, Applicants submit that claim 26, as well as dependent **claims 27-33**, are patentable.

Independent method **claim 34** requires the step of:

positioning a voltage probe adjacent the cable, whereby the liquid conducts at least a portion of the current between the probe and an insulation fault on the cable.

As noted above, the conductive members 25, 26 of Wantanabe cannot be positioned whereby current is conducted between the probe and an insulation fault on the cable, because the sheath of the high-voltage cable is intact (i.e., no fault is taught). As further noted above, the probe of Mashikian cannot be positioned whereby current is conducted between the probe and an insulation fault on the cable, because the probe is insulated. For at least that reason, Applicants submit that claim 34, as well as dependent **claims 35-41**, are patentable.

Claim 42 requires that a voltage source of between 80 and 100 volts be applied to the conductor. In contrast, both Wantanabe and Mashikian are directed to high voltage power distribution cables, for transmitting electrical power at on the order of 3000 V (Mashikian, col. 1, line 33) or $6.6\text{kV}/\sqrt{3}$ (Wantanabe [0062]). There is no teaching or suggestion to apply either of those references to the system of the present invention, which uses an 80-100 volt locator tone.

Further, Wantanabe is not directed to locating an insulation fault, but is instead directed to a completely different problem: measuring a voltage of the conducted current within an intact insulating sheath. The Examiner has identified no teaching or suggestion to apply features from Wantanabe to locate an insulation fault.

Because the combination of Wantanabe and Mashikian made by the Examiner is improper in rejecting claim 42, Applicants submit that that claim is patentable, and that claims dependent **claims 43-46** are patentable for at least the same reasons.

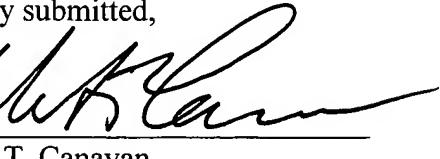
Conclusion

Applicants therefore respectfully submit that claims 20-46 are now in condition for allowance, and earnestly request that the Examiner issue a Notice of Allowance.

Should the Examiner have any questions regarding the present case, the Examiner should not hesitate in contacting the undersigned at the number provided below.

Respectfully submitted,

By



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